

**Notice of Allowability**

Application No.

10/687,104

Examiner

Cheryl Lewis

Applicant(s)

KEKRE ET AL.

Art Unit

2167

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the applicants' communication filed on July 5, 2006.
2. ☒ The allowed claim(s) is/are 1-24.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application                      |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____.   | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                    |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance              |
|  | 9. <input type="checkbox"/> Other _____.   |

### DETAILED ACTION

1. Claims 1-24 are allowed.

### Drawings

2. The drawings filed on October 16, 2003 are accepted by the Examiner.

### EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Brenna Brock on September 27, 2006.

4. The Specification has been amended as follows:

on page 9 of the specification, paragraph 0032, after 'Number 10/254,753,'  
insert Pat. No. 6,912,631;

on page 12, paragraph 0037, after 'Serial Number 10/143,059,' insert Pat. No. 6,785,789; and

on page 13, paragraph 0041, after 'Serial Number 10/326,427,' insert Pat. No. 6,880,053.

5. Claims 1, 11, 9, 20, 21, and 24 have been amended as follows:

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Claim 1. (Currently Amended) A computing device implemented method, comprising:

replicating a first change made to a primary volume, wherein

the first change is replicated to a secondary volume; and

replicating a second change made to the primary volume, wherein

the second change is replicated to the secondary volume,

the second change is caused by a restore operation, and

the replicating the second change comprises recording an order of the second change relative to the first change.

Claim 9. (Currently Amended) The method of claim 7, further comprising applying to a snapshot of the secondary volume the ~~instant-restore-initiated~~ plurality of changes; wherein the applying the plurality of changes to the secondary volume as the single atomic operation comprises performing an instant restore operation, and the instant restore operation restores the secondary volume from the snapshot.

Claim 11. (Currently Amended) A computer program product comprising: a computer readable storage medium, wherein the computer readable storage medium comprises program instructions executable ~~to~~ by a computing device:

replicate a first change made to a primary volume, wherein

the first change is replicated to a secondary volume; and

replicate a second change made to the primary volume, wherein

the second change is replicated to the secondary volume,

the second change is caused by a restore operation, and

the program instructions are executable to record an order of the second change relative to the first change.

Claim 12. (Currently Amended) The computer program product of claim 11, wherein the program instructions are executable ~~to~~ by a computing device:

perform periodic replication, wherein

the periodic replication replicates the first change and the second change, and replicating the second change comprises updating a volume map to indicate that a region of the secondary volume, which corresponds to a region of the primary volume changed by the restore operation, should be synchronized with the primary volume during a next period of periodic replication.

Claim 13. (Currently Amended) The computer program product of claim 11, wherein the program instructions are executable ~~to~~ by a computing device:

perform asynchronous replication, wherein

the asynchronous replication replicates the first change and the second change, replicating the second change comprises allocating an entry corresponding to the restore operation in a log of changes to the primary volume, and the entry includes information indicating the order of the second change relative to the order of the first change.

Claim 20. (Currently Amended) The ~~method~~ system of claim ~~7~~ 19, wherein the program instructions are executable by the processor to:

apply to a snapshot of the secondary volume ~~the instant restore-initiated a~~ plurality of changes; wherein applying the plurality of changes to the secondary volume

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~~as the~~ comprises performing a single atomic operation ~~comprises by~~ performing an instant restore operation, and the instant restore operation restores the secondary volume from the snapshot.

Claim 21. (Currently Amended) A system, comprising:

a primary volume;

a secondary volume;

a computing device comprising means for; and

means for replicating the primary volume to the secondary volume, wherein

the means for replicating record an order of first change to the primary volume

relative to an order of a second change to the primary volume, and

the second change is due to the primary volume being restored from a point-in-time copy of the primary volume.

Claim 24. (Currently Amended) A system, comprising:

a primary volume,

a secondary volume,

a primary ~~node~~ computing device coupled to access the primary volume; and

a secondary ~~node~~ computing device coupled to the primary ~~node~~ computing device by a network and coupled to access the secondary volume, wherein

the secondary ~~node~~ computing device maintains the secondary volume as a replica of the primary volume,

the primary ~~node~~ computing device is configured to record an order of a first change to the primary volume relative to a second change to the primary volume, the second change is caused by restoring the primary volume from a point-in-time copy of the primary volume; and

the secondary ~~node~~ computing device is configured to apply the first change and the second change to the secondary volume in the order recorded by the primary ~~node~~ computing device.

6. The following changes to the drawings have been approved by the examiner and agreed upon by applicant: The examiner has amended drawing figures 4a and 4b to illustrate that a box has been drawn around the entire figure and elements of figures 4a and 4b. The illustration indicates that the box is needed to show these individual figures as one entity and not a partial view of a figure entity (37 CFR 1.84(h)). In order to avoid abandonment of the application, applicant must make these above agreed upon drawing changes.

### **REASONS FOR ALLOWANCE**

7. The following is a statement of reasons for the indication of allowable subject matter:

Applicants' response filed on July 5, 2006 overcomes the prior art rejection under 35 USC § 102(e) by Mandal.

The prior art of record does not render obvious to one ordinarily skilled in the art at the time of applicant's invention nor anticipate the combination of claimed elements

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including 'the second change is caused by a restore operation, and the replicating the second change comprises recording an order of the second change relative to the first change' as recited in independent claim 1 and similarly recited in independent claims 11, 14, 21, and 24.

The remaining claims, 2-10, 12, 13, 15-20, and 23 are dependent claims, thus these claims are patently distinct over the art of record for at least the above reasons.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### **NAME OF CONTACT**

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheryl Lewis whose telephone number is (571) 272-4113. The examiner can normally be reached on 6:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

(571) 273-4113 (Use this FAX #, only after approval by Examiner, for "INFORMAL" or "DRAFT" communication. Examiners may request that a formal paper/amendment be faxed directly to them on occasions.).

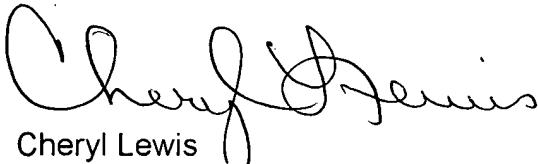
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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/ Technology Center (571) 272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>.

Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Cheryl Lewis  
Patent Examiner  
September 27, 2006



NEETA ROBINSON  
PRIMARY EXAMINER



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FIG. 4A

FIG. 4A

T = T0 Primary  
Volume 150A

A0	Region A
B0	Region B
C0	Region C
D0	Region D

T = T1 Primary  
Volume 150A

A1
B1 > B2
C0
D1

Next  
Volume Map  
302B

0
1
0
0

COW Snapshot  
304

B1

Secondary  
Volume 150B

A1
B1
C0
D1

T = T2 Primary  
Volume 150A

A1
B2
C0
D1

Current  
Volume Map  
302A

0
1
0
0

Next  
Volume Map  
302B

0
0
0
0

COW Snapshot  
304


Secondary  
Volume 150B

A1
B1 > B2
C0
D1

T = T3 Primary  
Volume 150A

A1 > A0
B2 > B0
C0
D1 > D0

Current  
Volume Map  
302A

0
1
0
0

Next  
Volume Map  
302B

1
1
0
1

COW Snapshot  
304

A1
B2
D1

Secondary  
Volume 150B

A1
B2
C0
D1

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T = T4	Primary Volume 150A	Current Volume Map 302A	Next Volume Map 302B	COW Snapshot 304	Secondary Volume 150B
	A0	0	1	A1	A1
	B0	1	1	B2	B2
	C0 > C1	0	1	C0	C0
T = T5	Primary Volume 150A	Current Volume Map 302A	Next Volume Map 302B	COW Snapshot 304	Secondary Volume 150B
	A0	1	0		A1 > A0
	B0	1	0		B2 > B0
	C1	1	0		C0 > C1
T = T6	Primary Volume 150A	Current Volume Map 302A	Next Volume Map 302B	COW Snapshot 304	Secondary Volume 150B
	A0	1	0		A0
	B0 > B3	1	1	B0	B0
	C1 > C2	1	1	C1	C1
	D0	1	0		D0

FIG. 4B

FIG. 4B